



# Guidance on the use of personal protective equipment (PPE) in hospitals during the COVID-19 outbreak

Modified 19/6/20

## Background

This document was developed by the Infection Control Expert Group (ICEG) and endorsed by the Australian Health Protection Principal Committee (AHPPC) to provide guidance on the use of personal protective equipment (PPE) in hospital settings during the COVID-19 outbreak.

These recommendations are based on *current evidence, the current status of COVID-19 in Australia*, risk assessment and expert advice. This guidance will be updated as new information becomes available or the epidemiology changes significantly.

This guidance is intended for health care workers in hospital settings, including:

- emergency department (ED)
- intensive care unit (ICU)
- operating suite
- surgery
- general medical and surgical wards
- obstetrics.

The same principles apply to general and neonatal paediatrics. However, detailed discussion of their application in paediatric practice is outside the scope of this document.

For current case definitions and testing criteria see [Communicable Diseases Network Australia \(CDNA\) National Guidelines for Public Health Units](#).

[Guidance on the use of personal protective equipment \(PPE\) in non-inpatient healthcare settings during the COVID-19 outbreak](#) is available.

Further information on the [use of masks and respirators in the context of COVID-19](#) is available.

**For clinical care of patients who are NOT potential\* or confirmed COVID-19 cases, standard infection prevention and control precautions - including use of PPE if required - should be observed i.e. business as usual.**

\*In this document "potential COVID-19 cases" refers to patients who:  
are suspected or probable cases (as defined in [Communicable Diseases Network Australia \(CDNA\) National Guidelines for Public Health Units](#)), or who  
are in quarantine because of close contact with a case, recent overseas travel or other exposure in the previous 14 days

## CURRENT EVIDENCE

Evidence relating to transmission of COVID-19 in hospitals is variable, sometimes contradictory and cannot always be extrapolated to the Australian context. Many uncertainties remain. The following advice is based on the best available evidence and the current epidemiology of COVID-19 in Australia, where community transmission is minimal, except in limited geographic areas.

- **Asymptomatic COVID-19** has been observed and can occur at any age. Its incidence and role in transmission is not yet known. High rates of asymptomatic infection have been reported during outbreaks in closed settings (e.g. cruise ships, aged care facilities), or in the context of high community prevalence.
- **Presymptomatic transmission** is well documented. The duration of infectivity before the onset of symptoms is uncertain but limited evidence suggests it can be up to 48 hours.
- The relationships between **viral RNA load and infectivity or disease stage** are uncertain
  - The presence of viral RNA does not necessarily indicate viable/infectious virus.
  - Viral RNA load at different stages of disease varies. It has been reported to be relatively high in the early stage, even when symptoms are mild, but to decrease in later stages of disease. It has also been reported to increase with late deterioration.
- There is limited and sometimes contradictory evidence about the mode of transmission of COVID-19 and its relevance to the type of respiratory protection required in different settings.
  - **Respiratory droplets** produced by breathing, talking and coughing contain **particles of varied sizes**.
    - large droplets (>10 micron) settle on surfaces close to the source patient.
    - small particles (<10 micron) can remain suspended and travel long distances.
  - Clinical and epidemiological evidence suggest that, like most respiratory viral infections, **COVID-19 is predominantly transmitted by large droplets**.
  - **Airborne transmission is believed, by most authorities, to be rare**.
    - The quantity of virus contained in small particles (<10 micron) is significantly less than in large droplets and viability is rapidly lost by desiccation.
    - The transmission dynamics of COVID-19 differ significantly from those of the few infectious diseases for which airborne transmission is recognised, e.g. TB, measles, varicella, for which reproductive numbers are much higher.
    - Some high-risk aerosol-generating procedures are likely to increase the risk of COVID-19 transmission.

## **CURRENT STATUS OF COVID-19 IN AUSTRALIA**

- By international standards, Australia has a high (and increasing) rate of testing and a very low percentage of positive results - currently (mid-June 2020) <1%.
- More than 60% of total cases in Australia (to mid-June 2020) have been acquired overseas
- The low numbers of cases and deaths from COVID-19 in Australia are in marked contrast to those in many parts of Europe, the United Kingdom and North America.
- Since the introduction of travel restrictions and physical distancing measures, the daily number of new infections in Australia has fallen dramatically.
- Community transmission is modest and limited to a few localised sites.
- The case fatality rate in Australia, overall, is <2% and the median age of death is ~80 years.
- Limited data are available about COVID-19 cases in health care workers. Of those for which information is available, a significant proportion were not occupationally-acquired.

**These data indicate that current containment measures in community and health care settings in Australia are effective, if consistently observed.**

## General guidance on care of patients who are **NOT** confirmed or potential<sup>1</sup> COVID-19 cases

During the COVID-19 outbreak, PPE for the care of inpatients who are NOT confirmed or potential cases of COVID-19, should be used in accordance with the *Australian Guidelines for the Prevention and Control of Infection in Healthcare (2019)*<sup>2</sup>.

**Standard precautions** are required for all patients regardless of known COVID-19 status, including hand hygiene and risk assessment to determine the level of PPE required, if any.

**Cough etiquette and respiratory hygiene** must be observed at all times.

**Physical distancing during the COVID-19 outbreak:** health care staff should stay at least 1.5m away from other people including:

- patients (except when unavoidable, e.g. during physical examination/care), AND
- members of the public, hospital visitors and other staff e.g. in wards, clinics and nonclinical areas e.g. during meetings, in offices and shared workplaces and during tea breaks etc.

### **Aerosol-generating procedures (AGPs) performed on non-COVID-19 patients.**

- Given the current low prevalence of COVID-19 in Australia, standard precautions, in addition to PPE appropriate for the procedure and setting (e.g. operating theatre), are adequate for the performance of AGPs on patients who are not suspected or confirmed cases of COVID-19. A surgical mask, gown, gloves, eye protection (and head covering if required as regular theatre attire) would typically be worn. A P2 or N95 respirator is not required in this context.

**Note: For AGPs performed on patients who are NOT suspected or confirmed cases of COVID-19, P2 or N95 respirators are not required, i.e., a surgical mask is appropriate.**

## General guidance on procedures performed on patients who **ARE** potential or confirmed COVID-19 cases

### **Care of patients with acute respiratory symptoms or potential or confirmed COVID-19**

- Standard precautions, cough etiquette and physical distancing apply, as for all patients
- Patients with acute respiratory symptoms should be asked to wear a surgical mask upon presentation to hospital.
- Patients should be placed in a single room with the door closed or in a physically separated closed area designated for suspected COVID-19 cases.
- The minimum requirement for an AGP on a patient with suspected or confirmed COVID-19 is a single room with the door closed or a space at least 3m from other patients, designated for the purpose. However, if possible, a high risk AGP (see page 6) should be performed in a negative pressure room or well-ventilated operating or procedure room.

<sup>1</sup> In this document "potential cases of COVID-19" are defined as those who are suspected or probable cases (as defined in [Communicable Diseases Network Australia \(CDNA\) National Guidelines for Public Health Units](#)) or who are in quarantine because of close contact with a case, recent overseas travel or other exposure in the previous 14 days.

<sup>2</sup> <https://www.nhmrc.gov.au/about-us/publications/australian-guidelines-prevention-and-control-infection-healthcare-2019#block-views-block-file-attachments-content-block-1>

If transfer outside of the room or designated area is necessary, the patient should wear a surgical mask during transfer and practice respiratory hygiene and cough etiquette.

### Environmental hygiene

- In addition to routine cleaning, frequently touched surfaces should be cleaned frequently, preferably after each use, or whenever visibly soiled, with detergent/disinfectant wipes or a detergent product, using disposable or laundry safe cloth.

Advice on *Environmental cleaning and disinfection for health and residential care facilities* is available on the [Department of Health website](#).

### Transmission-based precautions

- **Contact and droplet precautions** should be used for the routine care of patients with confirmed or potential COVID-19. **Contact, droplet and airborne precautions** should be used when performing AGPs on these patients.

**Note: Previous advice to use airborne precautions for care of patients with severe coughing has been withdrawn because:**

- viral load does not necessarily correlate with the stage or severity of COVID-19
- coughing predominantly generates droplets
- surgical masks used by patient and health care worker provide adequate protection

### Transmission of COVID-19

There is strong clinical and epidemiological evidence that the predominant mode of spread of COVID-19 is via **respiratory droplets** (produced during speaking, coughing, sneezing etc.):

- **Directly** during close face-to-face contact (within ~1.5 m) by exposure of the face (and then mucosae of mouth, nose or eyes) OR
- **Indirectly** by touching surfaces or fomites contaminated by respiratory droplets and then touching the face.

### Contact and droplet precautions; PPE for use in routine care of patients with confirmed or potential COVID-19

The following PPE should be put on before entering the patient's room:

- Long-sleeved, preferably fluid-resistant, gown or apron.
  - a cloth gown or apron is adequate when direct physical contact is minimal and/or the risk of splash is low (e.g. specimen collection, observations, medication delivery).
- Surgical mask. Varying levels of fluid resistant surgical masks are available. When the likelihood of exposure to body fluid is low, in routine care, a level 1 surgical mask is appropriate. Level 2 or 3 masks should be used when there is a risk of blood or body fluid exposure and in the operating theatre.
- Eye protection: face shield, wrap-around safety glasses, visor or goggles.
- Disposable non-sterile gloves when in direct contact with patient (use hand hygiene before donning and after removing gloves).

Use of boots or shoe covers is not recommended unless gross contamination is anticipated or required as standard attire in operating theatre or trauma room.

Long hair should be securely tied back.

Head covering is not required except as part of standard operating theatre attire or when performing a sterile/aseptic procedure (e.g. central line insertion).

### **Care should be taken to avoid self-contamination when removing PPE.**

The **principle** is to avoid contamination of clothing, skin or mucous membranes (including the eyes) with potentially contaminated PPE. Do not touch the front of the gown, eye protection or mask and perform hand hygiene between steps. The following sequence is recommended and safe but alternative sequences can be performed safely.

- Remove gloves without touching the outside of the glove and perform hand hygiene.
- Remove gown/apron, without touching the front of the gown, by folding it so that the external (exposed) side is inside; perform hand hygiene.
- Remove eye protection and mask outside the patient's room and perform hand hygiene.

Unsoiled PPE can be discarded into general waste; if visibly soiled e.g. with blood or faeces, PPE should be disposed of as clinical/infectious waste. (**Note:** Local jurisdictional regulations for waste disposal should be followed).

Only PPE marked as reusable should be reused after decontamination and reprocessing according to the manufacturer's instructions. All other PPE must be disposed of after use.

### **Contact, droplet and airborne precautions: use of PPE during AGPs for patients with confirmed or potential COVID-19**

The only modification for **airborne precautions**, is the requirement for use of a **particulate filter respirator (P2/N95)** or equivalent instead of a surgical mask. All other components of standard, contact and droplet precautions remain the same.

#### **Principles of use of P2/N95 respirators in COVID-19**

- P2/N95 respirators are required only in the context of AGPs.
- Health care professionals who use P2/N95 respirators should be trained in their correct use, including how to perform fit-checking and safe removal.
- Unless P2/N95 respirators are used correctly, protection against airborne pathogen transmission will be compromised.

**Fit-checking** is the minimum standard **for each occasion of use** of a P2/N95 respirator.

- An airtight protective seal is difficult to achieve in the presence of facial hair that underlies the edge of the respirator. If this is the case, facial hair should be removed or an alternative type of respirator - e.g. powered air-purifying respirator (PAPR) - considered (see below).
- If available, a range of types and sizes of P2/N95 respirators may need to be fit-checked to find one that achieves a protective seal (i.e. passes fit-check). If a suitable P2/N95 respirator cannot be found an alternative - e.g. PAPR - should be considered.

**Fit-testing** is defined in the Australian/New Zealand Standard 1715 2009 as a validated method for matching P2/N95 respirators with an individual's facial shape, but has not been widely applied in Australia. Despite increased awareness and demand, in the context of COVID-19, fit-testing of all health care professionals, who may need to use P2/N95 respirators, will be difficult due to limited supplies and range of types/sizes available.

**Note: Fit-testing does not guarantee a respirator will not leak, particularly if a different type or size is used – this reinforces the need to fit-check each time a respirator is used.**

**Transmission-based precautions, as outlined - including appropriate use of P2/N95 respirators - will provide high level protection of health care workers caring for patients with suspected or confirmed COVID-19.**

### **Powered air-purifying respirators (PAPR)**

- PAPRs are a possible alternative to P2/N95 respirators in selected circumstances.
- A number of different types of relatively lightweight, comfortable PAPRs are available.
- The use of a PAPR may not provide any additional protection compared to a well-sealed P2/N95 respirator.
- PAPRs should only be used by health care professionals trained in their use, including safe removal in correct sequence; respirator is last item of PPE to be removed.
- PAPRs should be used according to the manufacturer's instructions.
- If a health care professional is required to remain in the patient's room continuously for a long period to perform multiple AGPs e.g. more than one hour, the use of a PAPR may be considered for additional comfort and visibility.
- PAPRs used during sterile procedures should be suitable for use to maintain sterile field.
- PAPRs designed for use in settings outside of health care are not recommended.
- Manufacturer's instructions for reprocessing of reusable PAPR components and management of filters should strictly be followed.

Care is required with removal of a PAPR, which is associated with a risk of self-contamination.

Only PPE marked as reusable should be reused after decontamination and reprocessing according to the manufacturer's instructions. All other PPE must be disposed of after use.

### **Aerosol-generating procedures**

Some **AGPs** performed during the care of patients with suspected or confirmed COVID-19 may be associated with an increased risk of transmission. The following **examples** are illustrative of a range of high risk AGPs.

#### **Instrumentation or surgical procedures on the respiratory tract**

- Insertion or removal of an endotracheal tube and related procedures, e.g. manual ventilation and open suctioning of the respiratory tract
- Bronchoscopy and upper airway procedures that involve open suctioning
- Tracheotomy/tracheostomy (insertion, removal, open suctioning)
- Ear-nose-throat, faciomaxillary or transphenoidal surgery; thoracic surgery involving the lung.
- Post-mortem procedures involving high speed devices on the respiratory tract
- Intentional or inadvertent disconnection/reconnection of closed ventilator circuit

#### **Other procedures that generate respiratory aerosols**

- Manual or non-invasive ventilation (NIV): bi-level positive airway pressure ventilation (BiPAP); continuous positive airway pressure ventilation (CPAP)
- Collection of induced sputum
- High flow nasal oxygen
- Upper gastrointestinal instrumentation that involves open suctioning of URT
- Some dental procedures e.g. involving high speed drilling
- **Cardiopulmonary resuscitation is a special circumstance:**

- Because it is an emergency, life-saving procedure, special consideration is warranted for cardiopulmonary resuscitation (CPR).
- A systematic review<sup>3</sup> of AGPs showed that CPR was a high risk procedure, associated with an increased risk of transmission of SARS.
- **However, neither chest compression nor defibrillation, alone, was associated with increased risk of transmission unless accompanied by intubation.**
- Contact and droplet precautions are the minimum protection required in the context of CPR of a patient with suspected or confirmed COVID-19. A health care worker using contact and droplet precautions can safely commence defibrillation or chest compressions. However, some hospitals may recommend airborne precautions prior to commencement of chest compressions, if feasible.
- **Delay in the commencement of chest compressions should be avoided.**
- **A P2/N95 respirator should be used for active airway management procedures.**
- In the context of infrequent community transmission of COVID-19, chest compression and defibrillation are unlikely to pose a risk to first responders or bystanders who commence CPR without knowledge of the subject's COVID-19 status.

## Use of PPE in specific hospital settings

### Intensive care unit (ICU)

- **Contact and droplet** precautions are the minimum protection required for routine care of patients in ICU, who have suspected or confirmed COVID-19, and who:
  - are not ventilated (either invasive or non-invasive), nor on CPAP nor requiring HRNP or regular nebulisers
  - are intubated with a closed ventilator circuit, from which the risk of airborne transmission is minimal. However, during routine care when the circuit is opened (e.g. to change a heat-moisture exchanger) or if risk assessment indicates that inadvertent disconnection of the ventilator circuit may occur, use of a P2/N95 respirator should be considered.
- Contact, droplet and **airborne** precautions, including a P2/N95 respirator or equivalent, should be used for care of COVID-19 patients in ICU requiring or at risk of AGPs.
- If a health care professional is required to remain in an ICU patient's room for a long period (e.g. more than one hour) to perform multiple AGPs, the use of a PAPR may be considered, as an alternative, for greater comfort and visibility.

ICU staff caring for patients with COVID-19 (or any potentially serious infectious disease) should be trained in the correct use of PPE, including the use of P2/N95 respirators and PAPRs, by an infection prevention and control professional or other suitably qualified educator.

### Wards, including care of critically ill patients outside of the ICU setting

- Contact and **droplet** precautions should be used for care of COVID-19 patients in general wards.

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<sup>3</sup> Tran K, Cimon K, Severn M, Pessoa-Silva CL, Conly J. Aerosol generating procedures and risk of transmission of acute respiratory infections to healthcare workers: a systematic review. PLoS One. 2012;7(4):e35797.

- Contact, droplet and **airborne** precautions should be used for care of COVID-19 patients in general wards, when performing an AGP
  - AGPs should be performed in a negative pressure room (or a standard isolation room with door closed).
  - the number of persons present in the room should be minimised.

### Emergency departments

- Contact and **droplet** precautions should be used for routine care of COVID-19 patients in the emergency department.
- Contact, droplet and **airborne** precautions should be used for care of COVID-19 patients when performing an AGP (e.g. passage of an endotracheal tube).
  - AGPs should be performed in a negative pressure room, where possible (or a standard isolation room with door closed).
  - the number of persons present in the room should be minimised.

### Operating suite

**NOTE: For procedures performed on patients in an operating suite who are NOT confirmed or potential cases of COVID-19, the usual surgical PPE for the clinical circumstances should be used i.e., surgical mask, theatre cap, gown, gloves, eye protection.**

**Routine infection prevention and control principles should be strictly adhered to during elective surgery, including avoidance of unnecessary entry and exit from the operating theatre during surgery.**

**The number of people in the theatre should be limited to those required for clinical or educational purposes.**

- Surgical procedures for patients with confirmed or potential COVID-19 should be performed only in an emergency.

Separate guidelines are available for use of PPE by anaesthetic and surgical staff caring for patients with confirmed or potential COVID-19 in the operating suite, during different types of surgery or procedures.

The same general principles apply as outlined above:

- **Standard precautions** apply to the care of all patients, including use of PPE based on risk assessment.
- **Contact** and **droplet** precautions for anaesthetic or surgical procedures not involving AGPs in patients with suspected/confirmed COVID-19.
- **Contact, droplet and airborne** precautions for anaesthetic or surgical procedures involving AGPs with suspected/confirmed COVID-19.

### Labour ward

For care of a pregnant woman, with confirmed or potential COVID-19, during labour:

- The woman should be asked to wear a surgical mask, if tolerated.

- **Contact and droplet precautions** should be observed by labour ward staff, in addition to standard precautions.
- The woman's partner **or** other support person (one only) may attend the delivery even if s/he is in quarantine<sup>4</sup>. Precautions required to protect labour ward staff include:
  - On entering the hospital, the partner/support person should: perform hand hygiene and put on a surgical mask (to protect staff); in the labour ward put on a gown (to protect clothes from blood/liquor).
  - On leaving the labour ward, the partner/support person should remove gown and perform hand hygiene; perform hand hygiene and remove mask (if not in quarantine) when leaving premises.
- If the partner is in quarantine as a close contact, s/he should observe precautions as instructed by the public health unit and wear a mask until reaching home.
- **A person with acute respiratory or other symptoms consistent with COVID-19 should not attend the delivery.**

## Where can I get more information?

For the latest advice, information and resources go to [www.health.gov.au](http://www.health.gov.au)

Call the National Coronavirus Health Information Line on 1800 020 080. The line operates 24 hours a day, seven days a week. If you require translating or interpreting services, call 131 450. The telephone number of your state or territory public health authority is available on the coronavirus page at [www.health.gov.au/state-territory-contacts](http://www.health.gov.au/state-territory-contacts)

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<sup>4</sup> Quarantine is required for someone who has had close contact with a potential or confirmed case, recent overseas travel or other exposure in the last 14 days but who remains asymptomatic.